

PROPANE

I claim:

1. A process for preventing, controlling and extinguishing fire in an enclosed air-containing area which contains combustible materials of the non-self-sustaining type, which comprises introducing into the air in said enclosed area an amount of at least one fluoro-substituted propane selected from the group of $\text{CF}_3\text{-CHF-CF}_3$, $\text{CHF}_2\text{-CF}_2\text{-CF}_3$, $\text{CF}_3\text{-CH}_2\text{-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CH}_2\text{F}$, $\text{CF}_2\text{H-CF}_2\text{-CF}_2\text{H}$, $\text{CHClF-CF}_2\text{-CF}_3$, $\text{CHF}_2\text{-CF}_2\text{-CF}_2\text{Cl}$, $\text{CF}_3\text{-CHCl-CF}_3$, $\text{CF}_3\text{-CHF-CF}_2\text{Cl}$, and $\text{CHF}_2\text{-CFCl-CF}_3$ sufficient to impart a heat capacity per mol of total oxygen that will suppress combustion of the combustible materials in said enclosed area.
2. A process as in Claim 1 wherein the amount of said propane in said enclosed area is maintained at a level of about 4 to 100 volume percent.
3. A process as in Claim 1 wherein the amount of said propane in said enclosed area is maintained at a level of about 10 volume percent.
4. A process as in Claim 1 wherein at least 1% of at least one halogenated hydrocarbon is blended with said ^{propane}ethane introduced into said enclosed area, said halogenated hydrocarbon being selected from the group consisting of difluoromethane, chlorodifluoromethane, 2,2-dichloro-1,1,1-trifluoroethane, 1,2-dichloro-1,1,2-trifluoroethane, 2-chloro-1,1,1,2-tetrafluoroethane, 1-chloro-1,1,2,2-tetrafluoroethane, pentafluoroethane, 1,1,2,2-tetrafluoroethane, 1,1,1,2-tetrafluoroethane, 1,2-dichloro-1,2-difluoroethane,

1,1-dichloro-1,2-difluoroethane,
3,3-dichloro-1,1,1,2,2-pentafluoropropane,
1,3-dichloro-1,1,2,2,3-pentafluoropropane,
2,2-dichloro-1,1,1,3,3-pentafluoropropane,
5 2,3-dichloro-1,1,1,3,3-pentafluoropropane,
1,1,1,2,2,3,3-heptafluoropropane,
1,1,1,2,3,3,3-heptafluoropropane,
1,1,1,2,3,3,3-hexafluoropropane,
1,1,1,3,3,3,3-hexafluoropropane,
10 1,1,1,2,2,3,3-hexafluoropropane,
1,1,2,2,3,3,3-hexafluoropropane,
3-chloro-1,1,2,2,3-pentafluoropropane,
3-chloro-1,1,1,2,2-pentafluoropropane,
1-chloro-1,1,2,2,3-pentafluoropropane,
15 3-chloro-1,1,1,3,3-pentafluoropropane,
3-chloro-1,1,1,2,2,3-hexafluoropropane,
1-chloro-1,1,2,2,3,3-hexafluoropropane,
2-chloro-1,1,1,3,3,3-hexafluoropropane,
3-chloro-1,1,1,2,3,3-hexafluoropropane and
20 2-chloro-1,1,1,2,3,3-hexafluoropropane.

5. A process for extinguishing a fire which comprises introducing a volume of at least one fluoro-substituted propane selected from the group of
25 $\text{CF}_3\text{-CHF-CF}_3$, $\text{CHF}_2\text{-CF}_2\text{-CF}_3$, $\text{CF}_3\text{-CH}_2\text{-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CH}_2\text{F}$,
 $\text{CF}_2\text{H-CF}_2\text{-CF}_2\text{H}$, $\text{CHClF-CF}_2\text{-CF}_3$, $\text{CHF}_2\text{-CF}_2\text{-CF}_2\text{Cl}$,
 $\text{CF}_3\text{-CHCl-CF}_3$, $\text{CF}_3\text{-CHF-CF}_2\text{Cl}$, and $\text{CHF}_2\text{-CFCl-CF}_3$
sufficient to provide an extinguishing concentration in
an enclosed area, and maintaining said concentration at
30 a value of less than 80 volume percent until said fire
is extinguished.

6. A process as in Claim 5 wherein at least
1% of at least one halogenated hydrocarbon is blended
35 with said ethane introduced into said enclosed area,

said halogenated hydrocarbon being selected from the group consisting of difluoromethane, chlorodifluoromethane, 2,2-dichloro-1,1,1-trifluoroethane, 1,2-dichloro-1,1,2-trifluoroethane, 2-chloro-1,1,1,2-tetrafluoroethane, 1-chloro-1,1,2,2-tetrafluoroethane, pentafluoroethane, 1,1,2,2-tetrafluoroethane, 1,1,1,2-tetrafluoroethane, 1,2-dichloro-1,2-difluoroethane, 1,1-dichloro-1,2-difluoroethane, 3,3-dichloro-1,1,1,2,2-pentafluoropropane, 1,3-dichloro-1,1,2,2,3-pentafluoropropane, 2,2-dichloro-1,1,1,3,3-pentafluoropropane, 2,3-dichloro-1,1,1,3,3-pentafluoropropane, 1,1,1,2,2,3,3-heptafluoropropane, 1,1,1,2,3,3,3-heptafluoropropane, 1,1,1,2,3,3,3-hexafluoropropane, 1,1,1,3,3,3,3-hexafluoropropane, 1,1,1,2,2,3,3-hexafluoropropane, 1,1,2,2,3,3,3-hexafluoropropane, 3-chloro-1,1,2,2,3-pentafluoropropane, 3-chloro-1,1,1,2,2-pentafluoropropane, 1-chloro-1,1,2,2,3-pentafluoropropane, 3-chloro-1,1,1,3,3-pentafluoropropane, 3-chloro-1,1,1,2,2,3-hexafluoropropane, 1-chloro-1,1,2,2,3,3-hexafluoropropane, 2-chloro-1,1,1,3,3,3-hexafluoropropane, 3-chloro-1,1,1,2,3,3-hexafluoropropane and 2-chloro-1,1,1,2,3,3-hexafluoropropane.

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A fire extinguishing composition consisting essentially of comprising at least 4 volume percent of at least one fluoro-substituted propane selected from the group of CF₃-CHF-CF₃, CHF₂-CF₂-CF₃, CF₃-CH₂-CF₃, CF₃-CF₂-CH₂F, CF₂H-CF₂-CHF₂, CHClF-CF₂-CF₃, CHF₂-CF₂-CF₂Cl, CF₃-CHCl-CF₃, CF₃-CHF-CF₂Cl, and CHF₂-CFCl-CF₃.

2. 8. The composition of Claim 7 wherein at least 1% of at least one halogenated hydrocarbon is blended with ^{said fluoro-substituted propane} ~~said propane introduced into said enclosed area~~, said halogenated hydrocarbon being selected from
- 5 the group consisting of difluoromethane, chlorodifluoromethane, 2,2-dichloro-1,1,1-trifluoroethane, 1,2-dichloro-1,1,2-trifluoroethane, 2-chloro-1,1,1,2-tetrafluoroethane,
- 10 1-chloro-1,1,2,2-tetrafluoroethane, pentafluoroethane, 1,1,2,2-tetrafluoroethane, 1,1,1,2-tetrafluoroethane, 1,2-dichloro-1,2-difluoroethane, 1,1-dichloro-1,2-difluoroethane, 3,3-dichloro-1,1,1,2,2-pentafluoropropane,
- 15 1,3-dichloro-1,1,2,2,3-pentafluoropropane, 2,2-dichloro-1,1,1,3,3-pentafluoropropane, 2,3-dichloro-1,1,1,3,3-pentafluoropropane, 1,1,1,2,2,3,3-heptafluoropropane, 1,1,1,2,3,3,3-heptafluoropropane,
- 20 1,1,1,2,3,3,3-hexafluoropropane, 1,1,1,3,3,3,3-hexafluoropropane, 1,1,1,2,2,3,3-hexafluoropropane, 1,1,2,2,3,3,3-hexafluoropropane, 3-chloro-1,1,2,2,3-pentafluoropropane,
- 25 3-chloro-1,1,1,2,2,3-pentafluoropropane, 1-chloro-1,1,2,2,3-pentafluoropropane, 3-chloro-1,1,1,3,3-pentafluoropropane, 3-chloro-1,1,1,2,2,3-hexafluoropropane, 1-chloro-1,1,2,2,3,3-hexafluoropropane,
- 30 2-chloro-1,1,1,3,3,3-hexafluoropropane, 3-chloro-1,1,1,2,3,3-hexafluoropropane, and 2-chloro-1,1,1,2,3,3-hexafluoropropane.

3.
a 9. A fire extinguishing composition consisting essentially of comprising at least one fluoro-substituted propane selected from the group of $\text{CF}_3\text{-CFH-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CHF}_2$, $\text{CF}_3\text{-CHF-CF}_2\text{H}$, $\text{CF}_3\text{-CH}_2\text{-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CH}_2\text{F}$, $\text{CF}_2\text{H-CF}_2\text{-CHF}_2$, $\text{CF}_3\text{-CF}_2\text{-CHCl}_2$, $\text{CHFCl-CF}_2\text{-CF}_2\text{Cl}$, $\text{CHF}_2\text{-CCl}_2\text{-CF}_3$, $\text{CF}_3\text{-CHCl-CClF}_2$, $\text{CHF}_2\text{-CF}_2\text{-CHClF}$, $\text{CF}_3\text{-CF}_2\text{-CH}_2\text{Cl}$, $\text{CClF}_2\text{-CF}_2\text{-CH}_2\text{F}$, $\text{CF}_3\text{-CH}_2\text{-CClF}_2$, $\text{CHClF-CF}_2\text{-CF}_3$, $\text{CHF}_2\text{-CF}_2\text{-CF}_2\text{Cl}$, $\text{CF}_3\text{-CHCl-CF}_3$, $\text{CF}_3\text{-CHF-CF}_2\text{Cl}$, and $\text{CHF}_2\text{-CFCl-CF}_3$.

10. The composition of Claim 9 wherein nitrogen or any other propellant usually used in portable fire extinguishers is added in sufficient quantity to provide a pressure of at least 140 psig in said portable fire extinguisher.

a 11. The composition of Claim 9 wherein at least 1% of at least one halogenated hydrocarbon is blended with said fluoro-substituted propane, said halogenated hydrocarbon being selected from the group consisting of difluoromethane, chlorodifluoromethane, 2,2-dichloro-1,1,1-trifluoroethane, 1,2-dichloro-1,1,2-trifluoroethane, 2-chloro-1,1,1,2-tetrafluoroethane, 1-chloro-1,1,2,2-tetrafluoroethane, pentafluoroethane, 1,1,2,2-tetrafluoroethane, 1,1,1,2-tetrafluoroethane, 1,2-dichloro-1,2-difluoroethane, 1,1-dichloro-1,2-difluoroethane, 3,3-dichloro-1,1,1,2,2-pentafluoropropane, 1,3-dichloro-1,1,2,2,3-pentafluoropropane, 2,2-dichloro-1,1,1,3,3-pentafluoropropane, 2,3-dichloro-1,1,1,3,3-pentafluoropropane, 1,1,1,2,2,3,3-heptafluoropropane, 1,1,1,2,3,3,3-heptafluoropropane, 1,1,1,2,3,3-hexafluoropropane,

1,1,1,3,3,3-hexafluoropropane,
1,1,1,2,2,3-hexafluoropropane,
1,1,2,2,3,3-hexafluoropropane,
3-chloro-1,1,2,2,3-pentafluoropropane,
5 3-chloro-1,1,1,2,2-pentafluoropropane,
1-chloro-1,1,2,2,3-pentafluoropropane,
3-chloro-1,1,1,3,3-pentafluoropropane,
3-chloro-1,1,1,2,2,3-hexafluoropropane,
1-chloro-1,1,2,2,3,3-hexafluoropropane,
10 2-chloro-1,1,1,3,3,3-hexafluoropropane,
3-chloro-1,1,1,2,3,3-hexafluoropropane, and
2-chloro-1,1,1,2,3,3-hexafluoropropane.

12. The composition of Claim 11 wherein
15 nitrogen or any other propellant usually used in
portable fire extinguishers is added in sufficient
quantity to provide a pressure of at least 140 psig at
21°C in said portable fire extinguisher.

13. A fire extinguishing composition
20 comprising at least one fluoro-substituted propane
selected from the group of $\text{CF}_3\text{-CFH-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CHF}_2$,
 $\text{CF}_3\text{-CHF-CF}_2\text{H}$, $\text{CF}_3\text{-CH}_2\text{-CF}_3$, $\text{CF}_3\text{-CF}_2\text{-CH}_2\text{F}$ and
25 $\text{CF}_2\text{H-CF}_2\text{-CHF}_2$.

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